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Indian Standard

BELT DRIVES — PULLEYS — QUALITY, FINISH AND BALANCE

ICS 21.220.10

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

June 2002 **Price Group 2**

Pulleys and Belts Sectional Committee, BP 29

NATIONAL FOREWORD

This Indian Standard which is identical with ISO 254 : 1998 'Belt drives — Pulleys — Quality, finish and balance' issued by the International Organization for Standardization (ISO) was adopted by the Bureau of Indian Standards on the recommendations of Pulleys and Belts Sectional Committee and approval of the Basic and Production Engineering Division Council.

The text of this ISO Standard has been approved as suitable for publication as Indian Standard without deviations. In this adopted standard, certain conventions are, however, not identical to those used in Indian Standards. Attention is particularly drawn to the following:

a) Wherever the words 'International Standard' appear referring to this standard, they should be read as 'Indian Standard'.

b) Comma (,) has been used as a decimal marker in the International Standard while in Indian Standards, the current practice is to use a point (.) as the decimal marker.

In this adopted standard, reference appears to the following International Standard for which Indian Standard also exists. The corresponding Indian Standard which is to be substituted in its place is listed below along with its degree of equivalence for the edition indicated:

International Standard	*Corresponding Indian Standard*	*Degree of Equivalence*
ISO 1940-1 : 1986 Mechanical vibration — Balance quality requirements of rigid rotors — Part 1 : Determination of permissible residual unbalance	IS 11723 (Part 1) : 1992 Mechanical vibration — Balance quality requirements of rigid rotors : Part 1 Determination of permissible residual unbalance (*first revision*)	Identical

At present there is no corresponding Indian Standard to ISO 4287 : 1997 'Geometrical Product Specifications (GPS) — Surface texture : Profile method — Terms, definitions and surface texture parameters'. The Committee responsible for the preparation of this standard reviewed the provisions of this ISO Standard and decided that it is acceptable for use in conjunction with this standard.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

BELT DRIVES — PULLEYS — QUALITY, FINISH AND BALANCE

1 Scope

This International Standard specifies the characteristics of quality which are common to all transmission pulleys. It establishes specific quality levels for the finish and balance of transmission pulleys and test pulleys.

This International Standard is applicable to transmission pulleys for V-belts, V-ribbed belts, flat or synchronous belts; it does not apply to those pulleys for variable speed drives that have one or more moving flanges.

The other characteristics of transmission pulleys may be found in the relevant International Standards.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of the publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 1940-1:1986, *Mechanical vibration — Balance quality requirements of rigid rotors — Part 1: Determination of permissible residual unbalance.*

ISO 4287:1997, *Geometrical Product Specifications (GPS) — Surface texture: Profile method — Terms, definitions and surface texture parameters.*

3 Choice and quality of materials

The pulleys shall be made of any material that can be shaped to the standardized dimensions and tolerances, and is capable of withstanding the conditions of service (heating, mechanical stresses, abrasion, environment, etc.) without damage. Moreover, it is desirable that the pulley material be capable of dissipating any significant heat which might be generated by the belts.

4 Surface roughness

4.1 Transmission pulleys

The surface roughness of the working surfaces shall not be coarser than the value given in table 1.

Table 1

Working surface	Surface roughness Ra [1)] µm
V-pulley and V-ribbed pulley grooves and all pulley bores	3,2
Flat pulley rims and all pulley rim edges	6,3
Synchronous pulley tooth flanks and tips:	
— industrial type drives	3,2
— high-performance type drives (for example for automotive applications)	1,6

1) As defined in ISO 4287.

4.2 Test pulleys

The surface roughness of the working surfaces shall not be coarser than the value given in table 2.

Table 2

Working surface	Surface roughness Ra [1)] µm
V-pulley and V-ribbed pulley grooves (dynamic test)	1,6
Synchronous pulley grooves	1,6
Idler pulleys	1,6

1) As defined in ISO 4287.

4.3 Edges

The edges of flat pulley rims, V-pulley grooves and V-ribbed pulley grooves shall be chamfered or radiused.

5 Balance

5.1 The purpose of balancing a pulley is to improve its mass distribution so as to diminish the out-of-balance forces exerted as it revolves; these forces cannot be completely eliminated, but the remaining imbalance shall not be greater than the allowable limit.

5.2 As balancing is an expensive operation, the specified limit of the residual imbalance should be given a value as large as the envisioned applications allow.

5.3 Two classes of balancing may be considered:

— balancing in one plane, called static balancing;

— balancing in two planes, called dynamic balancing.

5.4 Static balancing is usually sufficient; dynamic balancing may be necessary for pulleys with a wide-faced rim or those revolving at relatively high speeds.

5.5 Pulleys manufactured for stock shall be statically balanced since their future conditions of use are not known at the time of manufacture.

5.6 Static balancing shall be done so as to leave an eccentric residual mass on the working diameter (datum or effective, according to the type of pulley) which does not exceed the larger of the two following values:

a) 0,005 kg[1];

b) 0,2 % of the equivalent mass of the pulley, eventually including any companion bushing.

The equivalent mass is taken as the mass of a geometrically identical pulley made of cast iron.

5.7 When the rotational frequency n, in minutes to the power minus one (min^{-1})[2], of a pulley becomes known, it is advisable to ascertain whether dynamic balancing may be necessary, as follows.

Determine the limiting speed n_1 (min^{-1}) by reference to figure 1 or by calculation using the formula:

$$n_1 = \sqrt{\frac{1{,}58 \times 10^{11}}{ld}}$$

where

l is the pulley rim face width, in millimetres;

d is the diameter (datum or effective) of the pulley, in millimetres.

Then:

if $n \leqslant n_1$: static balancing should be suitable;

if $n > n_1$: dynamic balancing may be necessary.

5.8 For dynamic balancing, the operation shall be implemented in accordance with ISO 1940-1. The G quality grade is determined by the largest of the following two numbers:

$$G_1 = 6{,}3 \text{ mm/s}$$

$$G_2 = \frac{5v}{M} \text{ mm/s}$$

The expression for G_2 is derived from the definition in ISO 1940-1.

In this formula:

5 is the practical limit of the residual eccentric mass, in grams, specified in 5.6 a);

v is the circumferential pulley speed, in metres per second;

M is the equivalent mass of the pulley, in kilograms, as given in 5.6 b).

The G quality grade may be less than G_1 or G_2 if the user specifies a particular requirement.

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[1] This value applies only to pulleys where there is adequate material to remove for balancing. Many light-duty pulleys have inadequate space to drill balancing holes or to add appropriate masses by permanent means.

[2] The term "rotations per minute (r/min)" is usually used for rotating machines.

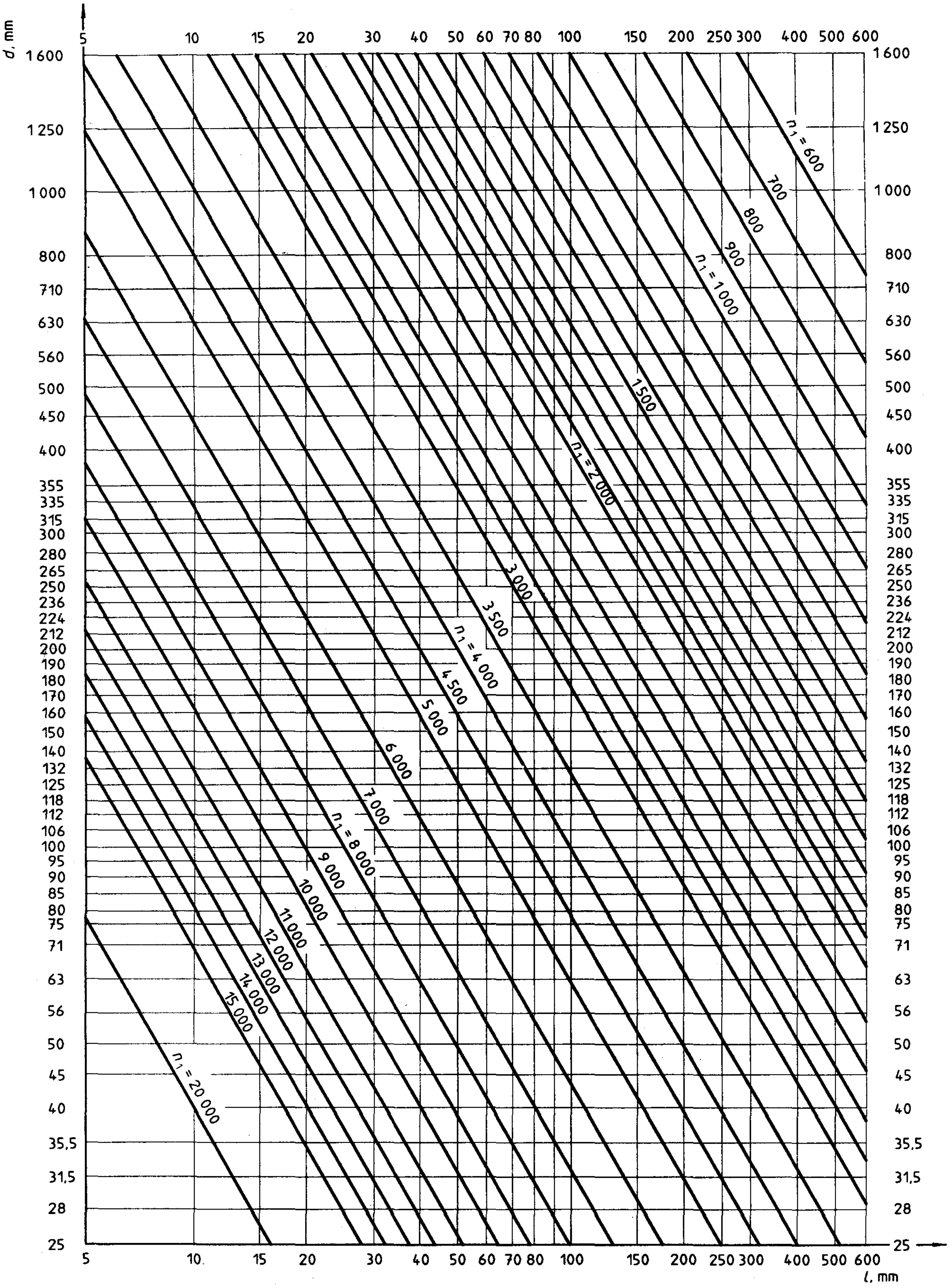

Figure 1 — Limit n_1 (min^{-1}) for static or dynamic balancing

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